

Decision delivery interval in emergency cesarean sections and fetal and maternal outcomes: A prospective cohort study

Decision delivery interval in emergency cesarean

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Abstract

Aim: The aim of this study is to evaluate the effect of this delay on fetal and -maternal outcomes and whether this delay causes adverse outcomes in significant proportions in a Moroccan population.

Material and Methods: A prospective observational cohort study was conducted from September 2021 to April 2022 in the Gynecology and Obstetrics service of the Provincial Hospital Hassan 2, Settat Morocco with 322 parturients who presented with an indication for an emergency caesarean section. Bivariate and multivariate logistic regression analyses were carried out to identify predictors. The multicollinearity diagnostic was performed based on the inflation of variance factor

Results: The average time to perform emergency caesareans was 68.95 ± 69.607 minutes (≈1 hour and 8 minutes) with extremes of 8 and 540 minutes. Over 78% of parturients had a Delivery Decision time Interval (DDI) of more than 30 minutes.

Unavailability of the ymergency kit (OR = 4.712, CI = 2.16-10.2), unavailability of the anesthetist team (OR = 3.239 CI = 1.532-6.847), patient's hesitation (OR = 2.883, CI = 1.471-5.651), and unavailability of the preoperative assessment (OR= 0.613, CI= 0.357-1.051) were considered as significant factors associated with prolonged DDI.

Discussion: Through this study, we have concluded that the current recommendations regarding the interval between decision and delivery were not respected in Moroccan current practice. Raising the healthcare professional's awareness regarding the importance of respecting the recommendations is crucial to improve the current situation and ultimately improve fetal and maternal outcome increase

Keywords

Cesarean Section, DDI (Decision to delivery interval), Feto-Maternal outcome

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Introduction

An emergency cesarean section delivery is one of the most commonly performed surgical procedures performed in pregnant women. This multidisciplinary procedure is complex and is associated with significant mortality and morbidity worldwide for both mother and fetus [1, 2].

On the other hand, we noted that, three-quarters of the 600,000 deliveries per year take place in hospitals, where cesarean sections are practiced on average only 13% to 18% of cases. However, this figure could be as high as 20% or more in a maternity service with a maternal and neonatal intensive care unit. In some peripheral hospitals, this is not the case, which explains why the caesarean section rate is limited to 8 or 10%. This result could be explained by the fact that in hard-to-reach areas or in remote regions, women often give birth at home or in an unsanitary environment, sometimes resulting in high maternal mortality rate [3].

The Royal College of Obstetricians and Gynecologists (RCOG), the Royal College of Midwives recommended that a caesarean section should be ready to be performed within 30 minutes, including hemorrhage from placenta previa, placental abruption, umbilical cord prolapse, and uterine rupture [4]. This collection of expert opinions imposes a considerable responsibility on clinicians faced with emergency delivery. International recommendations on the timing of emergency cesarean sections are imprecise; In Germany, this period is reduced to 20 minutes [5]. A study carried out in India in 2013 showed that when the delay between the decision and the birth of the child exceeds 75 minutes, the neonatal and maternal risks increase considerably [6]. In Africa, a study carried out in Côte d'Ivoire at the University Hospital of Cocody showed that the average time between the decision for an emergency cesarean section and fetal extraction is approximately 3 hours and 55 minutes [7]. The 30-minute response time has become a medical-legal benchmark for adequacy of obstetric care when a cesarean delivery is indicated [8]. There is a lack of data on the relationship between cesarean response times for these emergencies and subsequent maternal and infant outcomes in Morocco. In this regard, this study was conducted to determine the average time for carrying out emergency caesareans and to evaluate the influence of this delay on maternal and perinatal prognosis by carrying out a survey in a population of parturients in Morocco.

Material and Methods

Study design

A prospective descriptive study was carried out from September 1, 2021 to April 30, 2022 (i.e. within 6 months) in the Gynecology and Obstetrics service of the Provincial Hospital Hassan 2, Settat. It is the oldest and largest referral maternity hospital in the region with around 400 deliveries per month. It is equipped with an emergency unit with 6 common delivery rooms, 2 consultation boxes, 2 operating theaters and hospitalization rooms with a capacity of 65 beds.

Ethical considerations

Participants were informed that the survey was anonymous and that the collection of the data was strictly for scientific purposes. The verbal consent of the participants was requested.

Each participant was given the opportunity to discontinue participation if she did not agree. Participants were also reassured that not participating would not affect the progress of their medical care in the hospital.

Data Measurement

Data were collected using a structured questionnaire. The parturient were selected from the Gynecology and Obstetrics service. This was within the emergency unit or in hospitalization (for hospitalized patients) as soon as the obstetrician indicated the indication for emergency cesarean section. Since then, we began to count the time until the extraction of the fetus. Two midwives were selected and trained how to collect the data and supervised by the investigators. The data were checked for completeness, accuracy, clarity and cleaned up by the principal investigator. Counseling on emergency cesarean delivery began as soon as the indication was made. This was followed by a minimum preoperative assessment, if possible, and examination of the parturient. Anthropometric parameters were noted and the uterine height was measured using the tape measure and the fetal heart sounds with the Pinard fetoscope to ensure the feto-maternal state before the intervention. Once recruited, we noted all the complications that occurred before, during and after the caesarean section, whether maternal, hemorrhages, infections, and fever, and perinatal, transfer to intensive unit care and, Bag mask resuscitation, Apgar score at first minute, newborn death. All this information was recorded on a pre-established and tested technical sheet.

Inclusion and exclusion criteria

Inclusion criteria

All parturients who have undergone emergency cesarean delivery section were included in the study. To minimize potential confounding variables, including the effects of prematurity and prolonged surgical time on the newborn outcomes, inclusion criteria for this analysis were restricted to only those infants weighing 2,500 g or more.

Exclusion criteria

All parturients who underwent category-1 emergency cesarean delivery section with uterine rupture before decision, refused to give consent and fetus with gross congenital anomalies were excluded from the study.

Operational definition

- DDI: The time from the decision of cesarean to fetal delivery [9].
- Fever: The Infectious Diseases Society of America defines fever as a core temperature of 38.3 °C or higher [10].
- Wound infection: when the incision is accompanied by purulent drainage.
- Hemorrhage: defined as a cumulative blood loss of greater than or equal to 1,000 mL or blood loss accompanied by signs or symptoms of hypovolemia within 24 hours after the birth process [11].

Data analysis

The data were analyzed using SPSS version 20 (IBM Corporate). Descriptive statistics were performed. Categorical variables were presented in frequency and percentage. Continuous variables were presented in median (IQR) according to results of the Shapiro-Wilk normality test. Bivariate and multivariate logistic regression analyses were carried out to identify

predictors. The multicollinearity diagnostic was performed based on the inflation of the variance factor. The strength of the association was assessed using an odds ratio and 95% confidence intervals. A p-value less than 0.05 was considered statistically significant.

Ethical Approval

Ethics Committee approval for the study was obtained.

Results

Socio-demographic characteristics of parturient participants

A summary of the socio-demographic characteristics of participants is provided in Table 1; we recruited and analyzed 322 parturients who delivered by emergency caesarean section. The mean age of parturient was 31 ± 6.944 years. More than half of the participants (67.7%) declared a monthly family income of less than 3000 MAD (Moroccan Dirham), 166 (51.6%) had DDT for more 30 min. Of the 322 parturients, 16 (5%) were single, 306 (95%) were housewives; 124 (38.5%) had already given birth and 225 (69.9%) came from rural areas; 183 (56.8%) women had less than 4 ANC follow-up visits, 294 (91.3%) were unschooled and, respectively out of those, 167 (51.9%), 251 (78%) had DDT for more 30 min. Most of parturients were operated under general anesthesia (194 (60.2%)) and 137 (42.5) had DDT more 30 min. The majority of women were operated during the day (183 (56.8%)) and out of those, 121(37.6%) had DDI below 30 min

The time to perform emergency cesarean sections

The average time to perform emergency caesareans was 68.95

± 69.607 minutes (≈1 hour and 8 minutes) with extremes of 8 and 540 minutes.

Predictors of decision to delivery time interval in emergency Cesarean section

Many factors such as incomplete emergency kit (67.1%), patient’s hesitation (33.9%). unavailability of the preoperative assessment (46.3%), and unavailability of the anesthesiologist team (28.9%) were associated with prolonged DDI (Table 2).

Neonatal outcomes in emergency caesarean

Three hundred and twenty-two deliveries were included in the study; Table 3 shows infant outcomes for women who underwent a cesarean delivery for an emergency indication within 30 minutes of the decision to operate compared with greater than 30 minutes. Decision-to- incision intervals of 30 minutes or more were significantly associated: Apgar score < 7 was recorded in 51.9% of newborns at the first minute; (46.1%) needed Bag and mask resuscitation; (47.2%) were admitted to the neonatal intensive care unit, but 7.5% of newborns died (not statistically significant).

Maternal outcomes in emergency cesarean according to DDI

The relationships between caesarean section delay and maternal complications are shown in Table 3.

Before the cesarean section, no maternal complication was related to the caesarean section delay. Postoperatively, 165 had Hemorrhage (51.2%), 146 had fever (45.3%), 169 developed would infection (52.5%); the result was significant when the caesarean delivery time was more than 30 minutes (Table 3).

Table 1. Bivariate and multivariate logistic regression analyses results: predictors of the decision to the delivery time interval in emergency cesarean section, (OR with 95% CI) (N = 322).

Variables	Decision to delivery time interval		Bivariate analysis		Multivariate analysis	
	≤30min N=68 n (%)	>30min N=254 n (%)	COR (95% CI)	p	COR (95% CI)	p
Age (years)	<35	58 (18)	2.969 (1.446-6.098)	0.003	1.63 (0.704-3.774)	0.254
	>35	10 (3.1)				
Marital status: Married	58 (18)	248 (77)	7.126 (2.49-20.4)*	<0.05	0.139 (0.023-0.851)*	0.033
Living area: Urban	17 (5.3)	80 (24.8)	0.725 (0.394-1.334)	0.301	0.383 (0.118-1.24)	0.109
Income ≤3000 MAD	52 (16.1)	166 (51.6)	1.723 (0.93- 3.193)	0.084	0.65 (0.218-1.937)	0.44
Educational level	43 (13.4)	251 (78)	0.021 (0.006-0.071)*	<0.05	0.04 (0.009-0.179)*	<0.05
Parity: Primiparous	32 (9.9)	92 (28.6)	1.565 (0.912-2.687)	0.104	1.041 (0.496-2.183)	0.916
ANC follow up: ≤4	16 (5)	167 (51.9)	0.16 (0.086-0.297)*	<0.05	0.384 (0.185-0.797)*	0.01
Type of anesthesia	General	57 (17.7)	4.425 (2.217-8.832)*	<0.05	1.377 (0.615-3.085)	0.437
	Spinal	11 (3.4)				
Time of decision	Night	6 (1.9)	0.088 (0.037-0.211)*	<0.05	0.106 (0.035-0.32)	<0.05
	Day	62 (19.3)				

* P-value < 0.05; MAD (Moroccan Dirham)

Table 2. Bivariate and multivariate logistic regression analyses results: causes of the delay in performing an emergency cesarean section

Variables	Decision to delivery time interval			Bivariate analysis		Multivariate analysis	
	Total sample of parturients N=322 n (%)	≤30min N=68 n (%)	>30min N= 254 n (%)	COR (95% CI)	P	COR (95% CI)	p
Unavailability of the emergency kit	216 (67.1)	8(2.5)	98(30.40)	4.712 [2.16-10.2]*	<0.01	0.154 [0.067-0.354]*	<0.01
Unavailability of the preoperative assessment	149 (46 .3)	30 (9.30)	143(44.4)	0.613 [0.357-1.051]	0.07	0.254 [0.132-0.491]*	<0.01
Unavailability of the anesthesiologist team	93 (28.9)	59(18.3)	170(52.8)	3.239 [1.532-6.847]*	0.002	9.306 [1.803- 48.042]*	0.008
patient’s hesitation	109 (33.9)	56(17.40)	157(48.8)	2.883 [1.471 -5.651]*	0.002	0.929 [0.215-4.017]	0.921

* P-value < 0.05

Table 3. Bivariate and multivariate logistic regression analysis results: fetal and maternal outcomes in emergency caesarean section (OR with 95%CI) (N = 322).

Neonatal outcomes		Decision to delivery time interval		Bivariate analysis		Multivariate analysis	
		≤30min N=68 n (%)	>30min N= 254 n (%)	COR (95% CI)	p	COR (95% CI)	p
Bag mask resuscitation	no	13 (4)	106 (33)	0.336 [0.175 -0.647]*	0.001	1,024 (0,444-2,362)	0.956
	yes	54 (16.8)	148 (46.1)				
Neonatal death	no	57(17.7)	230 (71.4)	0.541 [0.250- 1.168]	0.118	0,466 (0,194-1,115)	0.086
	yes	11 (3.4)	24 (7.5)				
NICU admission	no	9 (2.8)	102 (31.7)	0.227 [0.108- 0.47]*	0.000	0,479 (0,203-1,127)*	0.092
	yes	59 (18.3)	152 (47.2)				
Apgar score at first minute	<7	16 (5)	167 (51.9)	0.160 [0.086- 0.297]*	0.000	0,197 (0,089-0,437)*	<0.05
	>7	52 (16.1)	87 (27)				
Maternal outcomes							
Fever	no	11 (3.4)	108 (33.5)	3.833 [1.919-7.655]*	<0.05	0,226 (0,108-0,475)*	0
	yes	57 (17.7)	146 (45.3)				
Hemorrhage	no	7 (2.2)	89 (27.6)	0.213 [0.093 -0.485]*	<0.05	0,388 (0,158-0,953)*	0.039
	yes	61 (18.9)	165 (51.2)				
Wound Infection	no	1 (0.3)	85 (26.4)	0.03 [0.004-0.217]*	0.001	0,042 (0,005-0,321)*	0.002
	yes	67 (20.8)	169 (52.5)				

* P-value < 0.05 Apgar appearance= pulse, grimace, activity, respiration. NICU= neonatal intensive care unit

Discussion

Decision to delivery time interval is a time range between decision for caesarean and delivery of a newborn. This interval appeared to have such an impact on both maternal and fetal complications; our findings can inform program managers on how to implement decision to incision quality improvement programs in our country. The results were not consistent with Tukel et al [12] and adverse neonatal outcomes were not related to the decision-to-incision interval, another study showed that shorter DDI may result in better fetal-maternal outcomes [13].

Cesarean delivery time

According to RCOG recommendations, the maximum delay is 30 minutes between indication and extraction [4]. In the present study, only 21.1 % of women in the emergency group could deliver within the 30-min period, which is contrary to a study where this could be achieved in 66.3% of cases in a high resource setting [14]

In our study, the mean ±SD of DDI was 68.95 ± 69.607 minutes (≈1 hour and 8 minutes) with extremes of 8 and 540 minutes which is higher than Sunanda et al. in which the mean ± SD was 36.3 ± 17 min [15].

On the other hand, it is less, compared with Kakou at the Cocody University Hospital in 2006 [16] (235 min (≈3h 55min)) and Mbongo (240 min (≈4h)) at the Brazzaville University Hospital in 2010 [17].

Causes of delayed caesarean section

In our study, several factors influenced this decision-to-birth delay, which is consistent with a study that has stated that a DDI below 30 min was achievable if the operation facilities were easily available [13].

Another study has shown that lack of surgical equipment was the main factor for prolonged DDI time [18]. A DDI below 30 min was difficult to attain in emergency cesarean due to the infrastructural challenges [19].

Most emergency ceasarean sections done during the daytime had generally a longer DDI when compared with the nightttime,

which was 18 (29%) vs 14 (13.9%). This result was comparable with Nakintu E, who reported that during the day, the DDI time was longer than at night [20]. This can be explained by the fact that during the day time, the operating room might be occupied by previous cases and especially currently in Morocco, the health system has a deficit of nurses and emergency physicians.

Our study reflects the difference in infrastructure, like the number of human resources including doctors, nurses and paramedical staff as well as the limited capacity of labor wards, operation theatre and overwhelming workload. Improvement in the above parameters can help in achieving recommended DDI. On the other hand, difficulties in obtaining patient consent for a CS procedure were identified as a factor in causing DDIs delayed for more than 30 minutes.

In Settat area, the majority of the population comes from rural areas and the local population likes large families; however, it is commonly accepted that cesarean section can limit the size of the family by risking the life of the pregnant woman through unnecessary intervention. The practice of cesarean section has been growing exponentially, statistics show that the rate of cesarean sections during this period has increased from 36% (8,476 acts) to 50% (12,691) of the total number of births. On the other hand, vaginal delivery decreased from 64% (15,400 procedures) to 50% (12,944 procedures). Thus, this fact scares the population and puts the credibility of the practice of Cesarean section in doubt.

Cesarean delay and maternal and perinatal prognosis

Several studies confirmed no association between DDI and fetomaternal outcome during emergency cesarean section [21]. On the other hand, Jane Thomas et al. stated that only delays in DDI longer than 75 min were significantly associated with worse feto-maternal outcome in emergency cesarean section [22].

The most common maternal indication for cesarean section in our study was SFA (31.1%) This result was significantly frequent when the time to cesarean section was longer than

30 minutes this finding is in line with Foumane et al (16.5%) [23]. It is important to note that 24 (7.5%) neonates who were delivered within 30 minutes also died.

Of all maternal complications, postoperative hemorrhage, fever, and wound infection increased significantly with the time to caesarean section.

Several studies have confirmed our findings and have reported that at DDI of less than thirty minutes, only 5% of women developed superficial scar infection, and no neonatal death, followed by a rate of 6.5% for neonates with an Apgar and PH of less than 7% [24].

Most of participants (60.2%) were operated under general anesthesia, and 42.5% in DDI for more than 30 min. This result was in discordance with a previous study in which 97.2% of emergency casarean sections were done under spinal anesthesia [25]. Our finding can be explained by the fact that anesthetists have a primary responsibility to the mother and reasonably guard their right to ensure that the procedure they use is safest for the mother, yet they are expected to do complex tasks under pressure of time.

Conclusion

An optimal DDI of ≤ 30 minutes is an important predictor of periconceptional outcomes. We suggest that the 30-minute interval is an acceptable limit to avoid maternal-fetal adverse events, but it is currently little evidence that a DDI of ≤ 30 minutes is the norm in emergency cesarean section. A decision delivery interval should be considered as one of the important contributing factors, but not as the sole factor in determining composite neonatal outcome; obstacles to performing a cesarean section on time were the incomplete kit, the unavailability of preoperative assessments, patient consent, the unavailability of the operating room and/or the anesthetist team.

Awareness of the factors causing DDI delays is important to help improve future patient outcomes. In particular, difficulty in obtaining patient consent for the surgery was identified as a major setback in prolonging DDIs among emergency CS cases. The immediate step would be to recruit and train emergency personnel, to equip structures with equipment and kits to prevent adverse events and to ensure the safety of the woman and her newborn. The use of continuous audits focused on the incision time interval decision for the health system should be beneficial in addressing this challenge.

Strengths and limitations of the study

The strength of this study is that subjects were homogeneous (only emergency C/S), this prospective study could provide representative data.

This study has not evaluated umbilical cord blood pH analysis, it not applicable in that hospital.

This study did not incorporate more important delay time; Anesthesia time (time taken for administration of anesthesia, the time taken from transfer and immediate start of anesthesia to skin incision); Operation time (the time taken from skin incision to delivery of the fetus).

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Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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References

- Shabila NP. Rates and trends in cesarean sections between 2008 and 2012 in Iraq. *BMC Pregnancy Childbirth*. 2017; 17(1):22.
- Mitikie KA, Wassie GT, Beyene MB. Institutional delivery services utilization and associated factors among mothers who gave birth in the last year in Mandura district, Northwest Ethiopia. *PLoS One*. 2020;15:e0243466.
- Zaouaq K. Women and access to reproductive health care in Morocco. *The Year of the Maghreb*. 2017; 17:169-83.
- Royal College of Obstetricians and Gynecologists Report of Joint Working Group. Organization of standards for maternity services. London: RCOG Press; 2011.
- Schauberger CW, Rooney BL, Beguin EA, Schaper AM, Spinder J. Evaluating the 30 minutes interval in emergency cesarean sections. *J AM Coll Surg*. 1994; 179:1515.
- Wanaka S, Hussen S, Alagaw A, Tolosie K, Boti N. Maternal delays for institutional delivery and associated factors among postnatal mothers at public health facilities of Gamo Zone, Southern Ethiopia. *Int J Women's Health*. 2020;12:127-38.
- Fouelifack Ymele F, Nokam Ngoundje FC, Fouedjio JH, Dongmo Fouelifa L, Enow Mbou R. Decision -delivery interval in emergency caesarean sections: Effect on maternal and perinatal outcome at the Yaoundé Central Hospital. *Health Sci. Dis*. 2019; 20 (2):13.
- Temesgen, Hailekirose Gebregzi A, Getinet Kasahun H, Ahmed SA, Woldegerima YB. Evaluation of decision to delivery time interval and its effect on fetal-maternal outcomes and associated factors in category-1 emergency caesarean section deliveries: prospective cohort study. *BMC Pregnancy and Childbirth*. 2020; 20:164.
- Wong TCT. Decision to delivery intervals and total duration of surgery for caesarean section in tertiary government hospital. *Singap Med J*. 2017; 58(6):332.
- Walter EJ, Hanna-Jumma S, Carraretto M, Forni L. The pathophysiological basis and consequences of fever. *Crit Care*. 2016;20(1):200.
- Degu Ayele A, Getnet Kassa B, Nibret Mihretie G, Yenealem Beyene F. Decision to Delivery Interval, Fetal Outcomes and Its Factors Among Emergency Caesarean Section Deliveries at South Gondar Zone Hospitals, Northwest Ethiopia: Retrospective Cross-Sectional Study. 2020. *Int J Womens Health*. 2021;13:395-403.
- Tucker L, Frühauf A, Dumbuya I, Muwanguzi P, Lado M, Lavallie D. Reducing Decision to Incision Time Interval for Emergency Cesarean Sections: 24 Months' Experience from Rural Sierra Leone. *Int J Environ Res Public Health*. 2021; 18(16):8581.
- Wilson DR, Dy J, Barrett J, Giesbrecht E, Stirk L, Bow Mr, et al., Revisiting the Care Pathway for Trial of Labour After Cesarean: The Decision-to-Delivery Interval Is Key. *J Obstet Gynaecol Can*. 2020; 42(12):1550- 54.
- Yemane Y, Tiruneh F. Incidence-proportion of maternal near-misses and associated factors in Southwest Ethiopia: a prospective cross-sectional study. *Int J Womens Health*. 2020; 12:1125-34.
- Gupta S, Naithani U, Madhanmohan C, Singh A, Reddy P, Gupta A. Evaluation of decision-to- delivery interval in emergency cesarean section: a 1-year prospective audit in a tertiary care hospital. *J Anaesthesiol Clin Pharmacol*. 2017;33(1):64.
- Radhakrishnan G, Yadav G, Vaid NB, Ali H. Factors affecting "decision to delivery interval" in emergency caesarean sections in a tertiary care hospital: a cross sectional observational study. *Int J Reprod Contracept Obstet Gynecol*. 2013; 2:651-6.
- Mbongo JA, Butoyi JM, Papandi-Ikourou A, Iloki LH. Emergency caesarean section at Brazzaville Hospital and University Centre. *Health Sci. Dis*. 2016; 17 (1).
- Melman S, Schreurs RHP, Dirksen CD, Kwee A, Nijhuis JG, Smeets NAC, et al. Identification of barriers and facilitators for optimal cesarean section care: perspective of professionals. *BMC Pregnancy Childbirth*. 2017;17(1):230.
- Ayalew Tiruneh G, Asaye MM, Solomon AA, Arega DT.. Delays during emergency obstetric care and their determinants among mothers who gave birth in South Gondar zone hospitals, Ethiopia. A cross-sectional study design.

Global Health Action. 2021; 14(1): 1953242.

20. Khemworapong K, Sompagdee N, Boriboonhirunsarn D. Decision-to-delivery interval in emergency cesarean delivery in tertiary care hospital in Thailand. *Obstet Gynecol Sci.* 2018;61(1):48–55.

21. Awel S, Bagilkar VV, Fekecha B. Delay in seeking institutional delivery service utilization and associated factors among mothers attending Jimma Medical Center, Jimma, Ethiopia. *Risk Manag Healthc Policy.* 2021;14:1255–62.

22. Thomas J, Paranjothy S, James D. National cross sectional survey to determine whether the decision to delivery interval is critical in emergency caesarean section. *BMJ.* 2004;328(7441):665

23. Foumane P, Mve KV, Ze Minkande J, Njofang NE, Dohbit JS, Mboudou E. Risk factors and prognosis of emergency cesarean delivery at the Yaoundé women's and children's Hospital, Cameroon. *Med Santé Trop.* 2014; 24: 89-93.

24. Yisma E, Smithers LG, Lynch JW, Mol BW. Cesarean section in Ethiopia: prevalence and sociodemographic characteristics. *J Matern Fetal Neonatal Med.* 2017;32(7):1–6.

25. Dunn CN, Zhang Q, Sia JT, Assam PN, Tagore S, Sng BL. Evaluation of timings and outcomes in category-one caesarean sections: a retrospective cohort study. *Indian J Anaesth.* 2016;60(8):546.

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